# Refrigeration Service Engineer

Vol. 1
No. 3

AUGUST • 1933

# THE ALCO
## TYPE NR
## THERMO VALVE

Type NR

**Has a wider application, operates on a closer range and has fewer moving parts than any Valve on the market**

AN IDEAL CONTROL FOR
$SO^2$-METHYL CHLORIDE-F 12

*WRITE FOR BULLETIN 129*

**ALCO VALVE CO., INC.**
**ST. LOUIS, MO.**

# KRAMER DOMESTIC

## QUICK FREEZ EVAPORATORS

Condensers

Unit Coolers

Commercial Evaporators All-Copper as well as Steel Tube Copper Fin for Ammonia

Kramer Dry Expansion Evaporators are furnished with either Chrome or Porcelain Plates—suitable for replacement or as equipment—made in five stock models from two to five trays.

Continuous tube construction processed below each tray sleeve assures quick freezing and eliminates the possibility of oil binding. Evaporators are All-Copper.

Furnished as bare units or complete with trays, control and expansion valve.

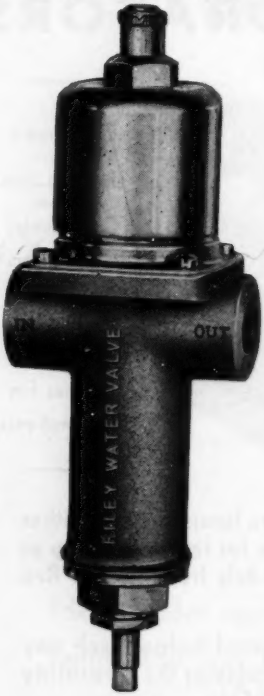
The NEW KRAMER REFRIGERATION PRODUCTS Catalog should be in your file! This ad attached to your letterhead—or a card request—will bring it to you promptly.

## TRENTON AUTO RADIATOR WORKS

Main Offices and Factory: Trenton, New Jersey

New York: 241 West 68th St. Pittsburgh: 5145 Liberty Ave.

# STANDARD
## REFRIGERATING APPLIANCES




No. 5480
**Water Regulating Valve**

AUTOMATIC EXPANSION VALVES
ACID NEUTRALIZERS
LIQUID FILTERS
LUBRICANTS
COMPRESSOR VALVES
FLOAT VALVES
SERVICE TOOLS
WATER REGULATING VALVES

BUY FROM YOUR JOBBER
or
Send for Bulletins

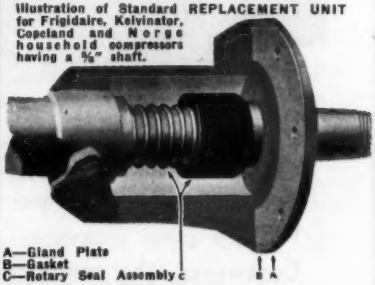
**RILEY ENGINEERING CORPORATION**
642 Beaubien St., Detroit, Mich.



# STOP--
## those Leaks around the compressor shaft

ROTARY SEALS have eliminated many of the service man's pet-peeves by preventing loss of refrigerant, and seal squeaks. In actual use over a period of ten years, Rotary Seals have demonstrated their absolute dependability. Save time and trouble with the Rotary Seal Replacement Unit.

Illustration of Standard REPLACEMENT UNIT for Frigidaire, Kelvinator, Copeland and Norge household compressors having a ⅝" shaft.




The replacement units referred to for Frigidaire, Kelvinator, Copeland and Norge, are the only complete units we can furnish without first having detailed information and drawing of present shaft and seal arrangement.

*We can also furnish a similar replacement unit consisting of all the parts necessary to replace the multiple disk type seal on Servel Units having a ¾" shaft.*

**ROTARY SEAL CO.**
809 W. Madison St., CHICAGO, ILL.

# *The* REFRIGERATION SERVICE ENGINEER

*Devoted to the Servicing of*
REFRIGERATION UNITS *and* OIL BURNERS

VOL. I | AUGUST, 1933 | NO. 3

## *Table of Contents*

Construction of Coil Bunkers—*by J. B. Williams* ..... 5
Time Cards ..... 7
New Frigidaire Beer Cooler ..... 8
Service Inspection Agreement—*by Herbert Herkimer* ..... 11
Filtration of Refrigerants—*by H. L. Shrode* ..... 13
Indoor Forced Draft Water Cooling Tower—*by C. R. Kranz* . 15
The Wayne Oil Burner ..... 18
New Self-Protecting Capacitor Motor ..... 21
Service Pointers ..... 22
What Do We Mean by Servicing? ..... 23
How to Use the Complaint Charts ..... 24
Field Experiences ..... 24
Complaint Chart No. 3 ..... 25
Editorials ..... 26
The Question Box ..... 27
Why the R.S.E.S. ..... 28
News of Local R.S.E.S. Chapters ..... 29

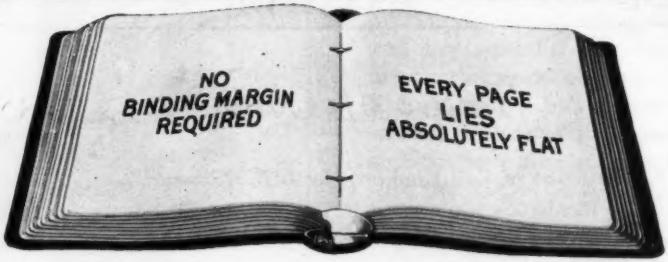
PUBLISHED MONTHLY BY
NICKERSON & COLLINS COMPANY
433-435 NORTH WALLER AVE., CHICAGO, ILL.
EASTERN OFFICE: 149 BROADWAY, NEW YORK CITY

Publishers for 42 years of Technical Books and Trade Journals Serving the Refrigeration Industries.
*Subscription: United States $2.00 per year. Single copies 25c. All other countries $3.00 per year.*

Copyright, 1933, by Nickerson & Collins Co., Chicago

# BIND—your copies of THE REFRIGERATION SERVICE ENGINEER for Future Reference

**ALL COPIES ARE PUNCHED TO FIT THIS BINDER**



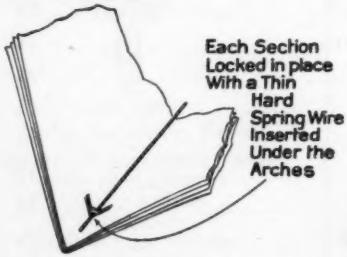

Every issue of this magazine will have valuable information which you will want to retain for future reference.

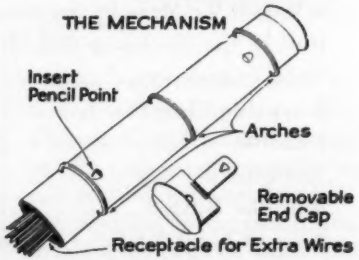
Here is a handy, substantial binder that permits you to add each copy readily as it is received. The binder is so constructed that regardless of the number of issues, every page lies flat and is easily read.

Holds twelve issues—an entire year's supply. No hunting around for lost or missing issues. The entire year's edition is always handy.

The name of the magazine is attractively stamped on the front cover in gold.

**Only $1.00 postpaid**




## It's simple — here is how it works

Each issue is locked in place with spring wire. It takes only an instant to add an issue. Reserve supply of extra wires for future issues is kept in the back-bone of the binder. File your copies promptly as received.

**Send Your Remittance of $1.00 to**

**THE REFRIGERATION SERVICE ENGINEER**
**433 NORTH WALLER AVE. CHICAGO, ILL.**

The Refrigeration Service Engineer

*A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners*

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 1, NO. 3 CHICAGO, AUGUST, 1933 $2.00 Per Annum

# Construction of Coil Bunkers

**Change-over from Ice to Mechanically Refrigerated Boxes Requires Check-up of Bunkers. Good Air Circulation from Bunker to Food Compartment Is Essential in Maintaining Low Temperatures. Simple Formulas to Estimate Proper Space.**

*By* J. B. WILLIAMS

BUTCHERS, grocers, dairymen, etc., are changing from time to time, their ice cooled refrigerators to mechanical cooling. The same box may be used if the insulation is in good condition. But too often in these cases, the cooling bunker is given little or no attention. Yet the success of the cooling depends as much upon this as it does upon the mechanical equipment.

Often the bunkers as construction for ice cooling are useless for cooling coil arrangement although they do serve the purpose for which they were designed.

One of the reasons for the change to mechanical cooling is no doubt, a desire for lower temperatures. But unless arrangements are made for good air circulation, from the bunker to the food compartment, little improvement can be expected, in spite of the mechanical refrigeration.

It may be best to remove the bunker entirely and construct one, more suitable for mechanical cooling. In the long run the money spent will be saved in a more economically running refrigerating equipment. In this article I will endeavor to show the essentials of proper bunker construction.

Fig. 1 shows the general plan of a bunker properly constructed for coil cooling.

The cool air from the coils flows down through the center air duct. It passes over and through the goods and becoming warm it rises up and passes through the ducts on the sides. It passes over the warm air baffle and falls down into the bunker. It passes through the cooling coils and again down through the cold air duct.

The design of these bunkers is not a hit-and-miss guess. There are some rules that the writer has found very useful.

### Proper Bunker Construction

These refrigerators or boxes, as the "trade" calls them, are usually 12 feet high. Their width and length as the manufacturers stock them are 8x8, 10x10, and 12x12. These dimensions of course are in feet. The amount of cooling effect necessary for them is in proportion to their cubic capacity and their outside surface. The required air circulation inside the box, for good results, will be directly related to the cooling effect. The size of the air passages must be

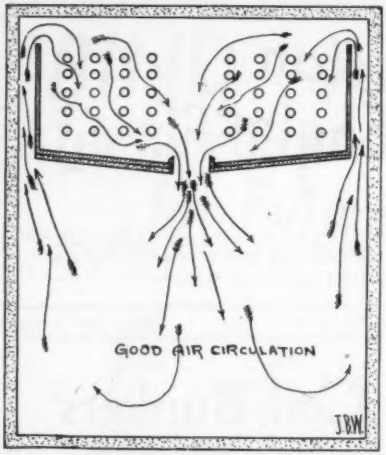



FIG. 1. PROPER BUNKER CONSTRUCTION SHOWING GOOD CIRCULATION.

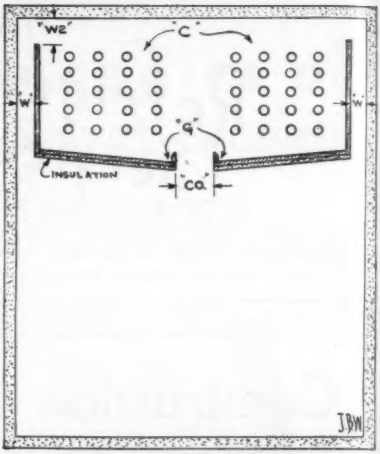



FIG. 2. FORMULA FOR DETERMINING AIR FLOW IN COIL BUNKERS.

large enough to accommodate this quantity of air. If the passages are made too large however, it is very likely that the remaining bunker space will be too small for the cooling coils.

From the above, it follows then that the size of these air spaces has a direct relation to the outside surface of the box.

### Simple Formulas

The writer has devised a formula on this basis that has been used over a period of many years, and proven to give splendid results.

Referring to Fig. 2, "C" is the cooling coils, located in the bunker. "CO" is the width of the cold air duct. "W" is the width of the warm air duct.

#### The Formula

S = surface of box, in square feet.
CO = width of cold air duct, in inches.
W = width of warm air duct, in inches.
L = length of box, in feet.
80 = a constant taken from a number of successful boxes.

$$CO = \frac{S \times 12}{80 \times L}$$

$$W = \frac{CO}{2}$$

W2 = space between cooling coil and ceiling.

The space "W2" plays a very important part in the successful operation of the box. It is the distance between the ceiling and the top of the warm air baffle. The cooling coils should never extend above the baffle or into this space. If the coil is too close to the ceiling, the ceiling will become cooler than the warm air duct. The moisture from the warm air will then condense on the ceiling and very likely drip upon the food-stuff below.

For a dry box make this space "W2," 2 inches more than the warm air duct.

### Insulating Bunker Floor

The under surface of the bunker floor should be insulated with ½ inch of corkboard or equal. The warm air baffle need not be insulated. It should, however, be constructed of not less than ⅝ inch matched lumber. Strips "G" should be made water tight to catch the drip from the coils when defrosting them.

As an example of the use of the formula let us assume a box somewhat out of the standard stock line. A box 10 feet wide 16 feet long and 12 feet high.

We must remember, of course, that a large number of boxes now in service were manufactured years ago and not of today's standard specifications.

The outside surface of the box will be:

$2 \times 16 \times 12 = 384 =$ sides
$2 \times 10 \times 12 = 240 =$ ends
$2 \times 10 \times 16 = 320 =$ top and bottom

$944 =$ total $= S$

$$CO = \frac{944 \times 12}{80 \times 16} = 8.85 \text{ inches}$$

$$W = \frac{8.85}{2} = 4.425 \text{ inches}$$

Make the cold air duct 9 inches; the warm air ducts each 4½ inches, and the space W2;

$4\frac{1}{2} + 2 = 6\frac{1}{2}$ inches

There is one more important point. Be sure that the cold air passage "CO" is never blocked-up. On more than one occasion the writer has found this passage filled with freshly dressed poultry for the Saturday trade. This might make an excellent cooler for the poultry but the air can not get through.

Iceless Refrigeration Accessories Co.

"We have just received the second edition of THE REFRIGERATION SERVICE ENGINEER, and we, too, wish to extend our compliments on your fine work. It is the type of trade journal that the refrigeration industry has long been in need of.

## TIME CARDS

THERE is an old-fashioned business custom that a seller has the right to demand a written receipt from the buyer for goods or service delivered.

A service man who goes out on a call, finishes the job and leaves without having obtained a written receipt is a poor business man.

Some day he will not be able to collect a bill, the customer denying the job was done. We know of one case, where the service man brought a lady of one of the best families into court and she denied that she or any of her help ever saw the service man. He lost the case because he had no written receipt or time card. If you employ a service man, insist that he bring a time card signed by the customer, with address, or if not home, by a maid, by a relation, janitor or anyone of adult age in the home or on the premises.

Do not neglect to get the address of perhaps a future witness in court. An employee neglecting to bring in a signed time card should not receive pay for the job until he does. The service man should not insert any price of material or labor on this card. That is done in the form of a bill, or if a cash job, upon completion of the work; the service man should obtain signature before asking payment. The following is a sample card used for years by Herbert Herkimer, refrigeration engineer on contract work.

TIME CARD

CUSTOMER .....

STREET..... CITY..... STATE.....

COMPLAINT .....

.....

.....

MATERIAL .....

SERIAL NO. ..... LOCATION.....

CALL RECEIVED: HOUR..... DAY..... MONTH..... 19.....

CHARGE.....HOURS

THE ABOVE COMPLAINT HAS BEEN REPAIRED SATISFACTORILY.

NAME .....

..... ADDRESS .....

SERVICE MAN

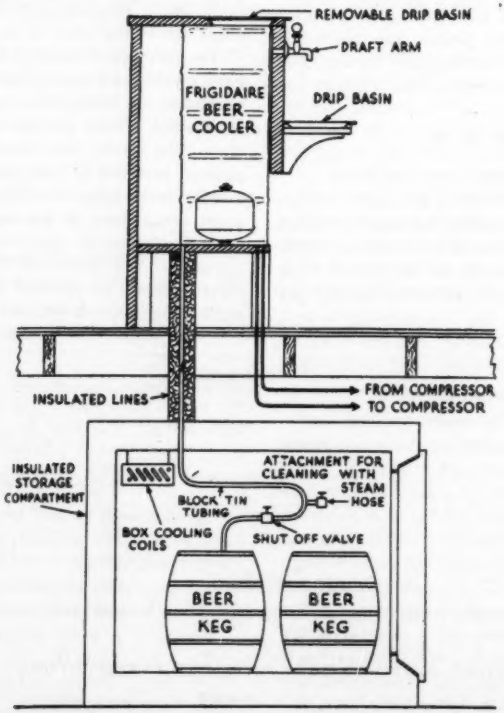
# New Frigidaire Beer Cooler

**Servicing Beer Coolers Opens a New Field for the Service Man. This Article Describes and Illustrates the New Semi-portable Frigidaire Cooler. Other Types Will Be Described in Subsequent Issues.**

DETAILS of Frigidaire Corporation's equipment for cooling draft beer were announced recently coincident with introduction of a new semi-portable unit suitable for homes, small restaurants, hotels and other establishments in which sale of beer is to be permitted.

The Frigidaire line of beer cooling equipment, according to H. W. Newell, vice president of this subsidiary of General Motors, has capacities ranging from three and a half to fifty gallons per hour, and is so designed that state and municipal sanitary codes governing the dispensing of beer will be met no matter how stringent they may become. The Fridigaire line consists of the following:

1. The TT-12CC beer cooler—which has capacities ranging from 8.4 to 50 gallons per hour, depending upon the size of the compressor used and the temperature of the beer as it leaves the keg. This unit has two outlets to serve both dark and light beer.




**A TYPICAL INSTALLATION OF A FRIGIDAIRE BEER COOLER**

To prevent flat or clouded beer, the kegs are placed in a room or compartment for the purpose of precooling, storing and settling the beer. They are then connected to the beer cooler by means of insulated lines, as illustrated. If desired, the kegs can be placed in a cooled compartment next to the Beer Cooler.

Temperature regulators which assure beer at proper temperatures.
All valves and connections enclosed and protected within the outer shell.
Cooling coil containing primary refrigerant, suspended above beer coils.
Galvanized steel shell for durability and long life.
Auxiliary tank to automatically accommodate secondary refrigerant while cleaning with hot solution or steam.
Fusible Plug; listed as standard by "Underwriters' Laboratories."
Refrigerant-tight, steel cylinder, containing cooling coil, beer coils and secondary refrigerant.
High speed, block tin beer cooling coils, continuous tube type—easy to clean.
Secondary refrigerant which speeds the cooling action many times.
Thick blanket of efficient insulation.

CROSS SECTION OF FRIGIDAIRE BEER COOLER.

2. The TT-4C beer cooler, which has capacities ranging from 8.5 to 27 gallons per hour, depending upon the same factors cited above. This unit has one beer outlet.

3. Enclosed, self contained units of the above types, with stainless steel shells. Semi-portable.

The beer cooling units are of the double refrigerant type that permits cleaning rapidly with hot solutions or live steam. Cooled beer again is available within three minutes after the cleaning process has been completed, according to C. E. Quigley, manager, beer cooling equipment division of Frigidaire.

SPECIFICATIONS

| | TT-4C | TT-12CC |
|---|---|---|
| Width | 11¼" | 14 5/16" |
| Height | 22" | 30" |
| Depth | 10¼" | 12 5/16" |
| (Including Auxiliary Tank) | 16⅜" | 20 5/16" |
| Net Weight | 70 lbs. | 125 lbs. |
| Shipping Weight | 110 lbs. | 175 lbs. |

*Capacity*—Depends upon pre-cooling temperatures, and condensing unit used. As much as 50 gallons per hour from 50° to 40°—25 gallons per hour from 60° to 40° with the Model TT-12CC, and as much as 27 gallons per hour from 50° to 40°—15 gallons per hour from 60° to 40° with the Model TT-4C.

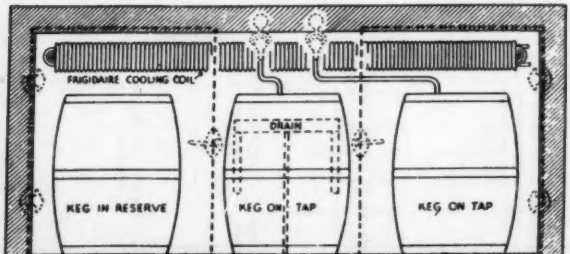
*Tank Shell*—Head; brass electro-tin plated.
*Shell and Bottom*—Steel, electro-tin plated.
*Exterior Casing*—Sheet steel, hot galvanized.
*Temperature Control*—Pressure regulating valve, Frigidaire Model PRV-20.
*Primary Refrigerant Control*—Expansion valve, Fridigaire Model PS-20.

C. E. Quigley, manager of the Frigidaire beer cooling equipment division, and the new household unit.

Typical of the construction and size of the entire line, are the following specifications:

Exterior casing is of steel with hot galvanized finish. The beverage cooler tank is of brass with electro tin finish. The shell and bottom are of steel with electro tin. The auxiliary tank for the refrigerant is of steel with hot galvanized finish.

The front, back and bottom are insulated with two inches of rock cork, the side with three inches of rock cork and the top is sealed with hot asphalt. The units are shipped completely assembled and ready for installation.




Frigidaire-refrigerated compartment for cooling beer in kegs. Two kegs are on tap while one in reserve is being cooled to proper drinking temperature.

# Service Inspection Agreement

**Adoption of Service Agreement Will Protect Service Men and Customer. Periodical Service Inspections Will Prevent Costly Service Calls for User. Suggested Forms of Agreements.**

THE article which appeared in the July issue of this magazine on the subject of "Service Inspection Agreements," by Herbert Herkimer, President of the Refrigeration Service Engineers' Society, has aroused widespread interest, and it is recognized that some standard form of service agreement is most desirable; therefore, further discussion on this subject is invited. The following communication has been received from a reader in St. Louis, Mo.

To the Editor:

As per the request of Mr. Herkimer in his article on service agreements, I am submitting one that can be used for either periodical inspection or contract work.

It is very simple in its construction, being almost devoid of any legal terms, so much feared by the average person, and I think it can be used anywhere.

Primarily drawn up as a contract to keep a refrigerator in working order, for a flat labor charge, for a period of a year, it is a very simple matter to adapt it to periodical inspection.

E. A. PLESSKOTT.

SERVICE CONTRACT

The ..... (Name of Company) hereby agrees to furnish all labor on the premises of the undersigned subscriber, during the period from ....., 193.., to ....., 193.., necessary to keep the subscriber's ..... (Made) ..... (Appliance) ..... (Number) in good running order.

For said service the subscriber agrees to pay the ..... (Name of Company) $....., as follows: $..... upon acceptance of this contract and $..... six months after date.

The ..... (Name of Company) obligation, under this contract, is limited to labor required for such repairs and adjustments as can be made upon the subscriber's premises, made necessary by ordinary wear and tear due to normal operation of the appliance. For shop work an additional charge of $..... per hour will be made payable upon completion of work.

The ..... (Name of Company) is not bound by any oral statement or representation not contained in the foregoing contract.

Accepted:

.....
(Name of Company)
by .....
.....
(Subscriber)
.....
(Address)
.....

The following form for a service agreement has been submitted by Mr. Herkimer:

REFRIGERATION SERVICE AGREEMENT

This agreement made in duplicate, this ..... day of ....., 193.., by and between ....., hereinafter called the Seller, and.....
.....
(Give name, street address, city and state.)
hereinafter called the Purchaser.

WITNESSETH:

In consideration of the performance by the Purchaser of the conditions and agreements hereinafter specified on the part of the Purchaser to be by him performed, the Seller agrees to render refrigeration service hereinafter described, on the following refrigeration installation:

Make of Unit .....
Serial Number ....., Size.....
Refrigerant ....., Location
.....
(Give street address, city and state.)
Application .....,
during the twelve months immediately following the date of this agreement.

*The Seller agrees:*

I. To supply a service man once every ..... months whose function it will be to:

1. Note the general operation and condition of the installation with particular reference to the operation of compressor, condenser,

motor, pumps and fans and the condition of evaporators, insulation, valve stem packing and compressor shaft packing or seal, making adjustments as required.

2. Check and adjust automatic control devices such as thermostat, expansion valve, high pressure cutout automatic regulating valve, and floats.
3. Check the condition of the refrigerant in the system as to operating pressures and quantity, purging air from the system and adding more refrigerant if necessary (provided it is available on the premises).
4. Check the lubrication as required, drain oil traps and supply oil (if available) to the compressor, motor and other parts as may appear necessary.
5. If the installation is a brine system, the brine solution is to be tested and necessary salt or calcium chloride added (if available). The operation of the brine pump is to be noted and its shaft packing, or seal adjusted if required.
6. Important temperatures are to be noted, as, for example, in refrigerators, of brine and of condensing water.
7. The motive power of the installation is to be noted, as, for example, condition of compressor motor brushes and armature and of belts, the belts to be tightened if necessary.

II. To review the monthly reports of the service man for the purpose of recommending:

1. Means for improving the operating economy of the installation.
2. The supplies and spare parts which should be ordered for the installation.
3. New developments which can be advantageously added to the installation.

*The Purchaser agrees:*

III. To pay to the Seller's service man, at the time of each regular service call, the sum of ..... dollars ($.....) plus the charge for any material and/or special labor supplied. (If all payments are made on the date of this agreement, a discount of 10% will be allowed.)

*It is Further Agreed that:*

IV. The Seller is not obligated to assume the charges or make a refund to the Purchaser for any service performed by other than the Seller or his authorized employees.

V. This Agreement may be cancelled by either Purchaser or Seller at any time upon written notice and becomes void upon sale or removal to a new location of the above described refrigeration installation.

VI. Purchaser shall hold Seller free and harmless at all times from any losses resulting directly or indirectly from the inspection of or work done on purchaser's refrigerating installation.

VII. No oil, refrigerant, packing, parts, or other material is included in the monthly charge stipulated herein nor does it include special labor or labor to effect repairs, except as hereinbefore specified.

Submitted for the Seller by: .....

.....

*Accepted:*

.....
(Purchaser)

By .....

Address .....

*Accepted:*

.....
(Seller)

By .....

Address .....

Our readers are invited to send in suggested forms for an agreement all of which will be submitted to a committee who will attempt to draft a form that would seem to fit at least average conditions, and when completed will be submitted to the members of the Refrigeration Service Engineers' Society, and published in this magazine.



Winslow Electric Shop,
Indiana.

"I am enclosing, herewith, my check for the amount of $2.00 to be applied to my account for subscription to THE REFRIGERATION SERVICE ENGINEER. It is of the greatest value to the service engineer, and the idea will be of benefit to manufacturer, salesman, purchaser and service man."—Morley L. Holmes.

---

Walter Hurlburt,
Illinois.

"Please accept the enclosed remittance on my account for subscription to THE REFRIGERATION SERVICE ENGINEER. The first two issues of your publication are very interesting and helpful and I shall look forward to reading your future issues.

# The Filtration of Refrigerants

**The First of a Series of Descriptive Articles on the Automatic Control of Small Commercial Refrigerating Systems. This Article Shows the Necessity of Proper Filtration of Recirculated Refrigerants.**

By J. L. SHRODE, President, Alco Valve Co.

THE proper filtration of recirculated refrigerants is a matter of such importance to the successful operation of control equipment that the greatest precautions should be taken to prevent foreign matter from circulafing through the system.

Most of the troubles encountered in automatic control equipment are directly due to the presence of foreign matter. There is always a considerable amount of foreign matter present in a new refrigerating system as a result of the original installation work. Such things as grit and dirt, pipe scale, broken off pipe threads, and excess litharge or white lead from the threaded joints constitute this foreign material. New systems should be blown out before being operated to eliminate as much of this material as possible. However, no matter what precautions are taken it is impossible to free the pipes and fittings of all the scale and dirt. There is a constant breaking down of the pipe surfaces throughout the life of a refrigerating system. This is due to the corrosive effect of the refrigerant and the water and oil present in it and to the erosive effect of the high velocity gas and the liquid refrigerant continually flowing through it.

### Protecting Control Valves

Foreign matter collected in an automatic valve will soon cause it to leak. If dirt or scale gets between the valve pin and the seat it will embed itself in the seat and the pin will no longer seat tightly. When there is a small leak at the valve seat the refrigerant leaking through expands at the seat. The resulting high velocity gas and liquid soon cut and score the pin and seat and before long the small leak develops into quite a sizable one. It can readily be seen that in this manner very small leaks originally caused by the presence of foreign matter will develop into leaks large enough to affect the operation of the automatic control system. If an automatic expansion valve or a magnetic valve is to function properly it must seat tightly when in the closed position. The importance of protecting control valves from foreign matter by installing filters ahead of them cannot be over-emphasized.

A very satisfactory liquid ammonia filter is shown in Fig. 1. It consists of a case housing and a built up filter core. The core is made up of a quantity of glass wool inserted into a cylindrical screen and retainer. A fine woven screen is fastened into the top end of the cylinder. The other end of the cylinder fits into a threaded plug. This plug and filter core are screwed into the filter housing. It is possible to replace the filter core without removing the entire filter from the pipe line by merely taking out the plug at the bottom of the filter. The old filter core is taken out of the plug, a new one forced into the recess in the plug, and the assembly is then threaded back into the filter housing. A new gasket is used whenever the plug is removed and replaced.

### Operation of Filter

In the filter illustrated the refrigerant enters at the right and first passes through the screen cylinder where the larger particles are filtered out. It then passes through the glass wool and finally out through the woven screen disc at the top. The refrigerant must pass through three different filtering media before it leaves the filter and enters the control valve. Experience in pipe line refrigerant filtration has

shown this built-up type of filter capable of removing even very small particles which would pass through the closest woven screen available.

A filter accumulates dirt over a period of time and the amount of available filtering area is, therefore, continually being reduced. The accumulation of a large amount of dirt in a filter greatly reduces its efficiency and capacity. If a filter becomes practically clogged up an increased pressure is required to force the refrigerant through the obstructed media. The filter may become

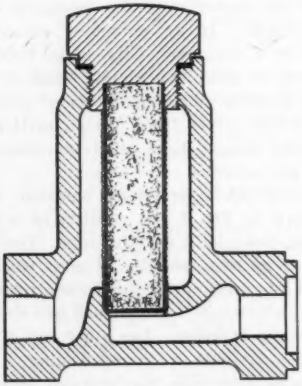


FIG. 1. LIQUID AMMONIA FILTER.

clogged to such an extent that expansion of the refrigerant will take place in the filter and cause it to frost. When a filter becomes frosted it is a certain indication that the filter is filled with dirt and should be cleaned. Filters should be cleaned regularly and when they become badly clogged new filter cores should be installed. The filters on large capacity refrigerating systems require more frequent cleaning than those on small systems.

For refrigerants other than ammonia the strainer may be smaller and less elaborate. Generally, a strainer fitting having a cylindrical screen for the filtering medium is inserted in the inlet end of the automatic control device. The entire low side is usually copper or aluminum tubing in which there is no scale. Because of this and the absence of pipe threads there is practically no foreign matter present. Also, the lower velocity of these refrigerants and their lubricating effect minimize the erosion of the valve parts due to dirt and the small single screen strainer is, therefore, quite satisfactory.

Filters should be used ahead of suction line valves as well as liquid valves. In addition to its effect on the seating of the valve, foreign matter may cause the magnetic suction line stop valve to stick in either the open or closed position. The piston construction of the usual magnetic suction valve requires rather close clearances between the valve walls and the piston and an accumulation of dirt between them may cause the valve to stick.

Due to the lower pressures and higher volumes encountered in the suction line, the suction strainer is not as fine as the liquid filter. The suction line strainer consists of only a cylinder of wire screen in a suitable housing. This strainer is also constructed to permit cleaning and replacing of the filter core.

It is well to install strainers immediately ahead of other magnetic liquid valves such as magnetic brine valves and magnetic water valves. These valves are generally of the same piston construction as mentioned above and are, therefore, affected by dirt in a similar manner. Circulating brine and water have decided corrosive and erosive effects upon the piping and in time carry considerable foreign matter through the system. This material may prove detrimental to the operation of the valve and should be removed by a strainer installed just ahead of the valve.

Good engineering practice demands that suitable filters must be installed ahead of all automatic control valves whether they are controlling the liquid refrigerant, brine, water, or the refrigerant vapor.

S S S

Houston Refrigeration Service.
Texas.

"Find attached money order for subscription to THE REFRIGERATION SERVICE ENGINEER. Your new trade paper is surely something that has long been needed in the small unit refrigeration field. It has just the type of information needed in this field.

# Indoor Forced Draft Water Cooling Tower

**One of Many Successful Installations Is Described in Non-technical Details in This Article. It Points Out Self Liquidating Features in the Operation of Small and Medium Capacity Refrigeration Plants.**

By C. R. KRANZ
Manager Cooling Equipment Division, Binks Manufacturing Co.

WATER, because of its apparent abundance in the minds of the average man, would seem to be as cheap as the very air we breathe. However, when used for condensing purposes in connection with commercial refrigeration plants its cost soon swells up to almost alarming proportions, and may well represent the largest item of expense in connection with operation of the refrigeration system.

Under ordinary circumstances "purchased" water from city mains is supplied to the condenser at a certain fixed rate, generally being somewhere in the neighborhood of 1½ to 2 gallons per minute for each ton of refrigeration, depending on its temperature. Thus, a 4½ ton plant would consume in round numbers about 9 gallons per minute, or about 6,500 gallons per operating day of 12 hours.

### What Price Water

Assuming a mean average city water rate of 15 cents per thousand gallons, its cost therefore would be .97 cents per day or $283.00 per year based on 240 operating days corresponding to 8 months of service. Larger systems naturally consume more water with proportionately greater water expense. Condensing water thus purchased and discharge to waste after it has taken up its load of heat in the ice machine condenser, is equivalent to throwing good, hard earned dollars directly into the sewer, which are gone forever.

### How a Progressive Meat Dealer Met the Water Situation

At store of the Rothe Oak Park Meat Shop, 906 S. Oak Park Ave., Oak Park, Ill., the water situation was dealt with in typical progressive fashion, in keeping with the company's policy of "close attention to operating details," by installation of an indoor cooling tower, which is conveniently located in basement of the establishment. The cooling tower Fig. I, which is in close proximity to the refrigeration machines, consists of a suitable housing and direct motor driven fan ⅛ hp. which supplies air to the tower at the rate of 1,200 cu. ft. per minute, the air being discharged at back of tower to the out of doors. The water circulating pump driven by a ⅛ hp. motor supplies condensing water at the rate of 10 g. p. m. against a total head of 60 ft. The water circulating pump obtains suction from base of the cooling tower from which it is forced through the condensers and returned to the tower where it is sprayed through specially designed patented "clog-proof" nozzles located in the upper portion of the cooling tower housing. A float control valve is also provided at base of the tower to compensate for evaporation losses which amounts to about 1½% of the water thus sprayed in the tower. Leak-proof inspection doors are also provided in both the upper and lower portion of the tower.

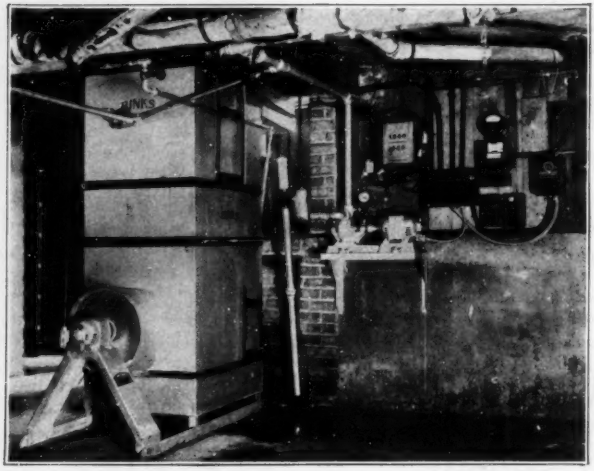


Fig. 1. View of Indoor Forced Draft Cooling Tower. The tower is placed in close proximity to the refrigerating machines.

The total refrigeration capacity handled by this tower is equivalent to about three tons, consisting of one 1¼ and one 1½ ton Brunswick-Kroeschell refrigeration units, and the tower is designed for a maximum circulation of 10 g. p. m. of circulating water arranged throughout for automatic operation, that is to say, the tower operates only when the machines are in operation, and will handle either one or both of the machines at the same time.

### Shows Real Economy

With city water rate of about 15 cents per thousand gallons before installation of the tower was made the annual water bill amounted to about $250.00 to $275.00 per year. Since the cooling tower installation as shown by Fig. 1 represented a total cost of about $300.00 installed it will thus pay out in approximately one year. The cost of cooling tower operation with current at 2 cents per K.W. hr. for the fan and water pump on a basis of 8 months' operation will not exceed $66.00. In this figure there is also included 10% depreciation charge and 6% on the investment. The savings thus effected, which is typical of many others where small commercial refrigeration plants are being used, cannot well be overlooked by any one who would even think of effecting economies in operating costs.

Fig. 2 shows one of the Brunswick-Kroeschell machines being served by this tower and Fig. 3 shows an interior view of the Rothe Meat Shop.

### Operating Data

Machines consists of:

One 1¼ ton Brunswick-Kroeschell Refrigeration unit.

One 1½ ton Brunswick-Kroeschell Refrigeration unit.

Capacity of Cooling Tower 10 g. p. m. maximum.

| | |
|---|---|
| Warm water to tower | 77° F. |
| Cold water from tower | 70.8 |
| Temperature reduction in tower | 6.2 |
| Air temperature to tower | 75.0 |
| Relative humidity | 73% |
| Wet bulb temperature | 68.5 |
| Cooling with reference to wet bulb | 2.3 |
| Head pressure on machines | 160 lbs. |
| Suction pressure | 40 lbs. |
| Temperature of make-up water | 70 lbs. |
| Overall cooling efficiency of tower | 73% |

Since the maximum degree of cooling possible by atmospheric means is represented by the wet bulb temperature, the efficiency is determined from the following formulae:

$$\frac{T_1 - T_2}{T_1 - T_3}$$

Where: T-1 equals temperature of warm water
T-2 equals temperature of cool water
T-3 equals temperature of wet bulb

The above test data was secured using Tycos calibrated thermometers and gages, with one machine only being operated.

With both machines in operation served by the one tower the following data was secured:

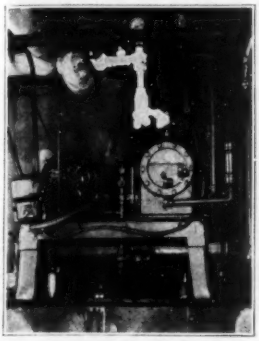


FIG. 2. REFRIGERATING MACHINE BEING SERVED BY INDOOR COOLING TOWER.

Refrigeration capacity 2¾ tons
Capacity of cooling tower 10 g. p. m.
Warm water to tower.....81° F.
Cold water from tower.....73
Temperature reduction ..... 8
Air temperature to tower.....75
Relative humidity .....68%
Wet bulb temperature.....68.2
Cooling with reference to wet bulb.... 4.8
Head pressure on machines.....165 lbs.
Suction pressure ..... 38 lbs.
Temp. of make-up water..... 70
Overall cooling efficiency of tower...62½%

The following tabulation shows the approximate savings which can be effected in cooling tower operation, as compared with the cost of "purchased" circulating water at 15 cents per 1000 gallons:

| Size Plant tons of Refrigeration | Yearly Water Cost at 15c Per 1000 Gals [1] | Total Estimated Tower Cost Installed | Total Tower Operating Cost [2] | Annual Savings [3] |
|---|---|---|---|---|
| 1½ tons. | $ 77.00 | $270.00 | $ 57.00 | $ 20.00 |
| 2½ tons. | 129.00 | 300.00 | 66.00 | 63.00 |
| 3½ tons. | 181.00 | 350.00 | 79.00 | 102.00 |
| 4½ tons. | 233.00 | 400.00 | 108.00 | 125.00 |
| 5½ tons. | 285.00 | 450.00 | 118.00 | 167.00 |
| 6½ tons. | 336.00 | 500.00 | 142.00 | 194.00 |
| 9 tons. | 451.00 | 600.00 | 190.00 | 261.00 |
| 12 tons. | 621.00 | 700.00 | 198.00 | 423.00 |

1. Estimated figures based on 8 months operation of refrigeration unit 12 hours per day or 2880 hrs. per year using city water at the rate of 2 gallons per minute per ton of refrigeration.

2. Operating cost based on 2880 operating hours per year electric power at 2 cents per K. W. hr., and also includes depreciation charge of 10% and interest charge of 6% on the investment.

3. By the elimination of depreciation and interest charges savings effected will be proportionately greater.

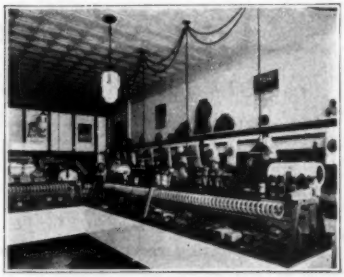


FIG. 3. INTERIOR VIEW OF MARKET.

From a series of carefully conducted investigations made by the writer, the following data has been secured on existing water rates in various communities of the United States:

| City and State | Cost Per 1000 Gallons |
|---|---|
| Mobile, Alabama | $0.16 |
| Bisbee, Arizona | .60 |
| Pine Bluff, Arkansas | .50 |
| San Francisco, California | .29 |
| Oakland, California | .25 |
| San Jose, California | .16 |
| Denver, Colorado | .08 |
| Stamford, Conn. | .12 |
| Wilmington, Delaware | .07 |
| Washington, D. C. | .08 |
| Miami, Florida | .11 |
| Atlanta, Georgia | .13 |
| Boise, Idaho | .10 |
| Chicago, Illinois | .07 |
| Oak Park, Illinois | .15 |
| Springfield, Illinois | .09 |
| Indianapolis, Indiana | .08 |
| Council Bluffs, Iowa | .13 |
| Des Moines, Iowa | .07 |
| Kansas City, Missouri | .09 |
| Lexington, Kentucky | .10 |
| Louisville, Kentucky | .06 |
| Alexandria, Louisiana | .15 |
| Lewiston, Me. | .12 |
| Baltimore, Maryland | .10 |
| Lowell, Mass. | .27 |
| Sommerville, Mass. | .16 |

| | |
|---|---|
| Boston, Mass. | .12 |
| Detroit, Michigan | .05 |
| Grand Rapids, Michigan | .10 |
| Duluth, Minnesota | .11 |
| Jackson, Mississippi | .13 |
| Butte, Montana | .20 |
| Omaha, Nebraska | .08 |
| Manchester, New Hampshire | .13 |
| Camden, New Jersey | .15 |
| Albuquerque, New Mexico | .20 |
| Albany, New York | .13 |
| Greensboro, North Carolina | .14 |
| Fargo, North Dakota | .15 |
| Akron, Ohio | .16 |
| Cleveland, Ohio | .08 |
| Cincinnati, Ohio | .16 |
| Tulsa, Oklahoma | .15 |
| Portland, Oregon | .10 |
| Pittsburgh, Penna. | .12 |
| Providence, R. I. | .10 |
| Aberdeen, S. D. | .25 |
| Knoxville, Tenn. | .12 |
| Dallas, Texas | .21 |
| Ft. Worth, Texas | .22 |
| El Paso, Texas | .14 |
| Houston, Texas | .12 |
| Burlington, Vermont | .13 |
| Newport News, Virginia | .28 |
| Wheeling, W. Virginia | .12 |
| Milwaukee, Wisconsin | .09 |
| Casper, Wyoming | .20 |

It will be noted the rates shown are for fairly large communities in practically every state, however, the general statement might be made that rates are anywhere from 25 to 50% higher in smaller communities, thus the 15 cent rate per thousand gallons mentioned in this article is conservative.

# The Wayne Oil Burners

**Oil Burner Servicing Requires Thorough Knowledge of the Mechanics of Burners. This Article Describes the Wayne "Type D" Burner and Suggestions for Determining Operating Failures.**

OIL has become the modern fuel for home heating, it having received general acceptance by the public, as is shown by the thousands of oil burners being installed each year.

It was pointed out in an article, which appeared in the June issue of this magazine, that the servicing of oil burners opens up a large and lucrative field for the service engineer and will, in combination with refrigeration, provide an all year service business.

There is much to be learned by the service man who may take up this oil burner service work. Those who desire to thoroughly familiarize themselves with the subject in the shortest space of time may take a course of instructions at one of the training schools and should also study carefully such text books as the "Hand Book of Oil Burners," issued by the American Oil Burner Association. Various phases of the subject will be taken up and discussed in future issues of the REFRIGERATION SERVICE ENGINEER. The leading makes of oil burners will be described and illustrated. This month there is given a brief description of the Type "D" Wayne oil burner, Fig. 1, with some service suggestions.

For ten years the Wayne Oil Burner Corporation standardized on a pressure atomizing burner of vertical design with a special vertical motor, and many thousands of these oil burners, Type D, are now in use. Recently, however, the company has designed and constructed a burner on the more conventional horizontal type. The new universal model, Wayne S-4, the latest burner produced by this company, will be described in a later issue.

### How the Oil Travels in a Wayne "D" Burner

When the Burner starts, a vacuum is created in the suction line. The patented Wayne Pump in the Sump or Reservoir is self-priming, and will pump oil from a tank 100 feet or more away from the Burner, and, if necessary, will lift the oil from a tank 25 feet deep.

Oil enters the suction line through the Foot Valve and is strained for the first time through the Suction Strainer. Then the oil goes through the pump and is put under a pressure varying from 100 to 150 lbs. and then through the second set of screens in the Strainer Assembly.

The pressure of the oil opens the Shut-

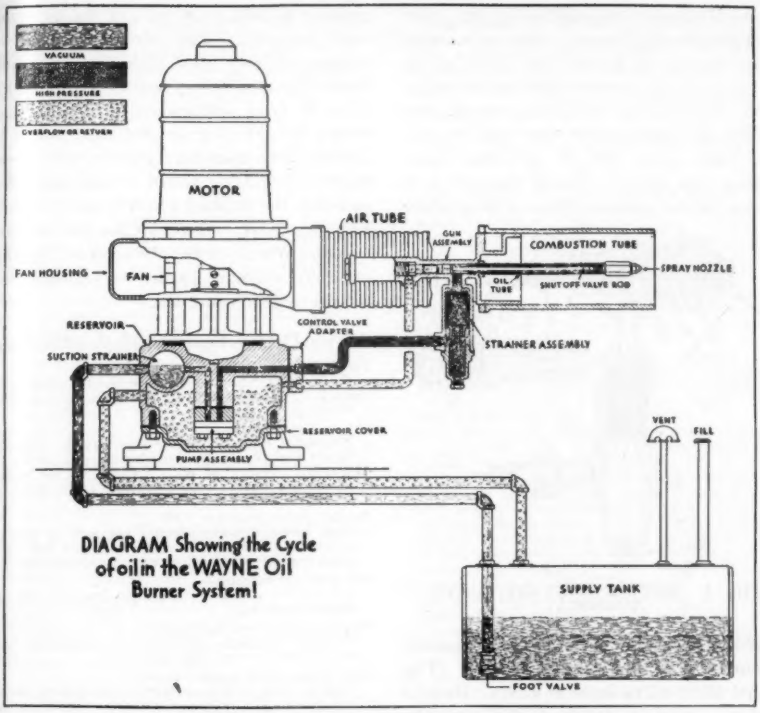



FIG. 1. DIAGRAMMATIC VIEW OF TYPE "D" WAYNE OIL BURNER.

Off Valve and permits oil, after passing through a third screen in the Spray Nozzle, to escape into the Firing or Combustion Chamber.

In order to insure a positive and plentiful supply of oil under pressure to the Spray Nozzle, the capacity of the Wayne Pump is usually four or five times in excess of actual requirements.

This excess of oil returns through the Overflow or Return Pipes back to the Reservoir or Sump, and from there back to the Supply Tank.

Thus, all of the oil that the spray tip orifice will permit to pass has been strained over and over by the three different sets of screens, and the oil is in prime condition for complete atomization and perfect combustion. When the proper grade of oil is used, a clogged spray tip in a Wayne Oil Burner is almost unheard of.

### Nozzle Shut-Off Valve Assembly

The D series burner is constructed with an oil shut-off valve, located in the firing nozzle assembly unit. This valve is provided to stop the flow of oil as soon as the burner stops operation. It is made up of a Monel metal valve seat located at point U, Fig. 2 and valve rod T. Valve rod T is opened by oil pressure from the pump against the sylphon bellows S. This action compresses bellows S and spring R, opening valve T a distance equal to the adjustment of stop screw Q. The oil pressure holds valve T in the open position all the time the burner is operating. As soon as the burner stops the oil pressure immediately starts to decrease, which allows bellows S and spring R to expand and close the valve. The stop screw Q is provided for the purpose of limiting the valve opening. When you

receive a burner from the factory this screw is in proper adjustment. *This adjustment should not be tampered with* unless cleaning the spray tip fails to allow the discharge of oil. In this case loosen lock nut F, turn screw Q in clockwise direction until it seats, then back screw off of seat two turns. Tighten lock nut F. Nozzle Strainer G is located in the pressure line. This strainer

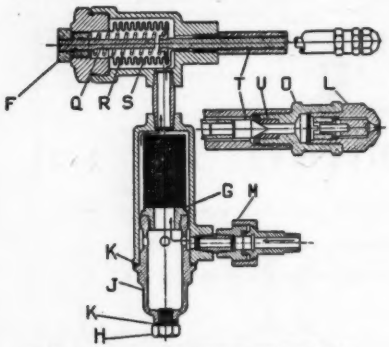



FIG. 2. NOZZLE SHUT-OFF VALVE ASSEMBLY.

should be cleaned at least once each heating season. To do this remove plug H (Fig. 2) and allow oil to drain in a pan. Remove strainer screen assembly J and clean by washing in kerosene. Carefully examine

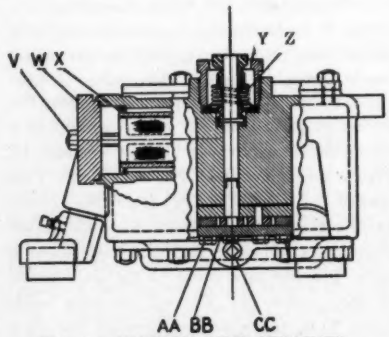



FIG. 3. SUCTION LINE STRAINER.

gaskets K to make sure they are in good condition before reassembling strainer.

### Suction Line Strainer

On all type D burners the suction line strainer is built as a part of the oil reservoir assembly. This strainer should be cleaned at least once each heating season. To do this remove cap screws V, Fig. 3, lift cover W from position and remove strainer basket X. All dirt and sediment should be cleaned from this basket and the wire screen washed by holding under a water tap. Reassemble the strainer which is now in condition to render service for another heating season. When putting the strainer together carefully examine gasket to see that this part is in good condition.

### Service Helps—Trouble and Possible Cause

Pump does not deliver oil—
Tank empty. Suction strainer clogged; foot valve stuck. Cracked fittings or split suction line. Pump gears worn.

Oil does not ignite—
Electrodes shorted. Spray tip clogged. Not sufficient pressure to open needle valve on firing assembly. Water in oil. Carbon on electrodes. Spray Tip rotor loose allowing oil to spray in stream. Defective transformer.

Burner motor does not run—
Fuse blown. Motor brushes not making contact. Open circuit in controls such as furnace control or stack control not breaking circuit. Power off.

Oil does not atomize—
Oil too heavy. Spray tip partly clogged. Not sufficient pressure.

Burner puffs when lighting—
Pressure too high. Electrodes too far away from oil. Late ignition. Too much air.

Fire burns after burner stops—
Needle valve in firing assembly not closing. Spray tip loose. Oil hitting electrodes. Spray tip too wide allowing oil to spray around combustion tube. Oil not atomizing spraying streams of oil in fire box.

Smoky fire—
Not sufficient air. Oil not atomizing. Oil too heavy. Motor not up to speed due to low voltage. Spray tip too large for combustion space. Poor draft. Too high pressure. Too low pressure. Lint gathered around fan housing spacer closing off suction of fan.

Low C.O.$^2$—
Too much air. Not enough air. Strong draft from chimney. Inefficient boiler. Improper bricking of fire pot. Not enough fire.

High pitch noises—
By-pass valve chattering. ¼ in. Oil tube from burner to firing assembly vibrating due to not having loop. Drive shaft seal squeaking.

Combustion roar—
Fire too large. Too much air. Furnace chimney connected with fireplace. Chimney draft too strong. No Draft-a-Justor.

Fire fluctuates—
Suction strainer clogged. By-pass valve sticking. Minor leak in suction line. Too much air.

High stack temperature—
Fire too large. Too much air. Chimney draft too strong. Furnace close to chimney. Inefficient heating plant. No baffle in flue gas travel.

Strainer screens clog—
Oil used with heavy paraffine base.

White fire—
Too much air.

Motor runs but no ignition—
Carbon on electrodes. Shorted electrodes. Electrodes too far apart. Defective transformer.

Ignition fails to shut off—
Stack control does not complete circuit. Wired for continuous ignition.

Back pressure when fire door is opened—
Too much air. Chimney plugged. Stack damper closed. Too much fire. Secondary air leaks around flue pipe or clean out door.

Requires continuous recycling—
Stack control does not make contact due to stack control too far from furnace, not sufficient heat to operate control; spray tip clogged. Motor brushes sticking damper in smoke pipe or in stack control and boiler closed; draft regulator between stack control and furnace; safety switch out of adjustment; low or fluctuating oil pressure; improper combustion allowing soot to collect on stack control element and preventing it from operating.

Thermostat calls for heat but burner fails to respond—
Loose connection in low voltage wiring. Power off. Burner shut-off by boiler control. Relay safety shut-off switch requires resetting. Series 10 controls. Short circuit in blue and white low voltage thermostat wires. Thermostat adjustment tampered with and points closed.

Thermostat calls for shut down but burner fails to respond—
Broken finger on rotary member of maintaining switch. D. D. S. motor stuck due to tight end bell. Stationary member switch not making contact. Blue low voltage wire broken. Gears sticking from heavy greases.

Fire to one side of fire box—
Dirty spray tip. Firing head not placed in the fire box straight or to one side. Air currents changed in combustion tube by deflector such as cement on inside of tube.

No draft from chimney—
Chimney clogged. Cracks in stack pipe. Chimney obstructed by higher buildings. Opening such as for fireplace or stove not closed.

Stack control operates too slow—
Too far from boiler. Burned out element. Not enough heat to operate and necessary to use a Protectorstat in the firing door.

Burner starts and stops too often—
Limit control set too low. Thermostat adjusted at too close a differential. Too much fire causing limit control to operate too fast.

House gets too cold before burner starts—
Thermostat out of adjustment.

Hot water gas heater blows out when oil burner starts—
Heater pipes connected too close to the furnace. Chimney draft too strong, requiring the use of a draft regulator.

Burns too much fuel—
Home heated too high temperature and the windows open. Poor construction or insulation in house. Insufficient heating system, or overload. Improper combustion. Too light fuel oil being used. Fire too small to give sufficient heat. Fire box improperly bricked.

Unable to clear fire—
Tip too large. Not enough air. Burner too small for heating plant. Poor chimney draft. Improper bricked fire box. Improper oil used. Not enough pressure to atomize.

Too great differential in room temperature—
Thermostat adjusted at too great a differential. Thermostat too close to hot air duct or radiator. Thermostat in room closed and not used. Heat limit control set too low or high.

Thermostat stops burner and temperature continues to increase 8 or 10 degrees with hot air system—
If the heat limit control is set too high and the circulation of the heating system is poor the furnace will be excessively heated before the proper heat reaches the thermostat and calls for a shut down. This excessive heat will continue to travel to the rooms and the temperature will often times increase 8 or 10 degrees.

Fumes from hot air furnace in room—
Joints in furnace need cementing, or castings cracked.

Gas fumes in basement—
Firing head not cemented tight or around bricking. Warped cleanout or firing doors.

Oil fumes in basement—
Oil spilt on floor near furnace. Oil leaking from pipes or burner.

## NEW SELF-PROTECTING CAPACITOR MOTOR

THE new Westinghouse single phase capacitor motors are equipped with a small disc type thermostat which protect themselves from burning out regardless of service conditions. Mounted on the motor frame, the thermostat opens the supply circuit when the motor temperature approaches a dangerous value, and automatically restarts the motor as soon as it cools down.

The last ounce of torque is delivered by the motor under abnormal loads since the motor remains on the line until the temperature approaches the danger zone. Because of their extreme silence, high efficiency and reliability these self-protecting motors are especially applicable to automatically controlled domestic devices, such as air conditioners, refrigerators, oil burners, etc.

The thermostat has but a single moving part. It consists of a small bimetallic disc which buckles at definite temperatures, "making" or "breaking" the circuit in response with temperature changes of the motor. Contacts carried by the bimetal disc open and close at the rate of 2000 feet a second—so fast that arcing is practically eliminated.

The unusual quietness of these self protecting motors is due to careful electrical design and the unique method of resilient spring mounting. Exhaustive tests prove that resilient steel springs absorb noise and vibration and are also free from aging, with the consequent loss of noise and vibration absorbing qualities. The base is pressed steel and this is attached to the motor proper, by springs.

# SERVICE POINTERS

**Readers are invited to send descriptions of "kinks" which they have found to be of practical help in their every day work. Just send your idea or sketch in the rough, which will be prepared for publication. All contributors' names will be printed. Address the "Kinks" Editor, REFRIGERATION SERVICE ENGINEER, 433 N. Waller Ave., Chicago.**

## Stuck Up High Side Float Check Valve

IT is now customary to install a check valve between high side float needle and evaporator. The check valve acts as an intermediate pressure control, to maintain a saturation pressure above freezing point (32° F,). A pressure of 25 lbs. gauge sulphur dioxide or 45 lbs. methyl chloride will prevent frost or liquid line between float and check valve. To loosen check valve which has a tendency to stick, build up a pressure between float and check valve by heating the tubing.

## Chemicals for Driers

ON page 15 of July issue is shown design for a heavy substantial drier. Every service man should own three of these.

1. One drier should be filled with granulated dehydrated calcium chloride for drying air only. Never suck air into a system for leak testing unless the air is passed through drier.
2. For drying or dehydrating sulphur dioxide liquid the drier should be filled with C.P. flake zinc oxide.
3. For methyl chloride liquid drying the drier should be filled with C.P. calcium oxide.

Six round trips of liquid through any drier is enough; then remove drier.—*H. Herkimer.*

## Belt and Fan Rotation

WHEN a motor drives a compressor the motor pulley (as the name implies) pulls on the flywheel of the compressor, causing rotation. The pull on the belt should be on the lower half of the belt; the loose side of belt being on top. This gives more belt contact and less belt slippage. Inasmuch as the condenser fan is usually on motor shaft, the blades of the fan should be bent to force air through condenser, not sucked through, and at the same time giving proper rotation for belt tension.

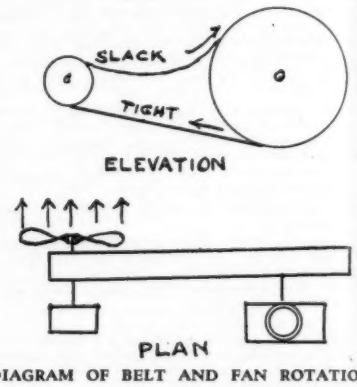



DIAGRAM OF BELT AND FAN ROTATION

## Noisy Operation

FREQUENTLY a service call will be made in answer to a complaint that the unit is operating noisily. In many instances, it will be found that a minor adjustment is only necessary. Probably the most frequent causes for such complaints may be found on checking the following:

Drive pulley and fly wheel out of line.
Fan rubbing or slipping.
Compressor seal squeak.
Unbalanced motor armature.
No lift or too much in exhaust valves.
Unit not level.
Compressor loose.
Motor or motor pulley loose.
Belt squeak or slap.
End play in motor.
Dragging motor brushes.
Squeaking spring suspension.
Vibrating connecting lines.
Chattering water valve.
Worn motor or compressor bearings.
No head clearance in compressor.
Surging in the water or drain lines.
Loose connecting rods, wrist pins, worn bushings, pistons, etc.
Compressor running dry.
Head pressure excessive.
Loose suction valve—broken spring.
Poor commutation on motor.
Back lash in gear drives.
Compressor pumping oil or liquid refrigerant.
Noisy compressor valves.

# What Do We Mean by Servicing?

**It Is Well to Ascertain in Advance That All Parties Concerned Have a Definite Understanding as to the Meaning of Servicing. This Article Suggests What Refrigeration Servicing Should Include.**

By H. HERKIMER

WARS have been fought, lives lost, and families broken up by the misuse of words.

Upon investigation I find that service men, executives and buyers all have a different opinion as to what refrigeration service consists of. The meaning of the word is too broad and if used in negotiating business is conducive to fraudulent statements of the seller, and disappointment to the buyer.

I therefore offer the following definition of *refrigeration service.*

1. To note the general operation and condition of the installation with particular reference to the operation of compressor, condenser, motor, pumps, fans, the condition of evaporators, insulation, valve stem packing, compressor shaft packing or seal, and making adjustments as required.
2. Check float and adjust automatic control devices such as thermostat, expansion valve, high pressure cutout automatic regulating valve.
3. Check the condition of the refrigerant in the system as to operating pressure and quantity, purging air from the system.
4. Check the lubrication as required, drain oil traps.
5. If the installation is a brine system, the brine solution is to be tested. The operation of the brine pump is to be noted and its shaft packing adjusted is required. Test congealing tank solution in domestic units.
6. Important temperatures are to be noted, as, for example, in refrigerators, of brine, of condensing water, and in ice cube chamber of domestic units.
7. The motive power of the installation is to be noted, as, for example, condition of compressor motor, brushes, armature and belts; the belts to be tightened if necessary.
8. Suggest means for improving the operating economy of the installation.
9. Advise of new developments which can be advantageously added to the installation.
10. Submit list of material, supplies and spare parts which should be ordered, and labor rate per hour for installation of said parts and supplies.

The above definition will be submitted for adoption to the New York Chapter of the Refrigeration Service Engineers' Society, after further criticism and suggestions of other chapters.

What doesn't servicing mean? It does not include installation of any part, oiling compressor, charging with gas, mixing brine, etc., in other words, any labor for removing something or adding something. The removal of a part or labor of installing a part we will define as *installation:* which, of course, should be charged at a minimum rate per hour of at least $1.60.

What does *maintenance* mean? Maintenance means *servicing plus installation.* The adoption by the industry of an authorized definition of 1, *Servicing;* 2, *Installation;* 3, *Maintenance,* will eliminate possibilities of misleading statements to the user.

It is to be noted that under no consideration is servicing to include the furnishing by the contractor of any material. It is also to be noted that in no case is installation to be construed as to the furnishing of any material, but only labor. The above two items are definitely defined.

However, the general public have an idea that maintenance means the furnishing of material in addition to servicing plus instal-

lation. This idea must be eliminated from all contracts. The writer suggests that the word maintenance does not include the furnishing of any material. The furnishing of material comes under another heading and is not considered as influencing in any way the object of determining the above definitions.

Criticism of these definitions, or constructive suggestions are very much desired, and should be sent to H. T. McDermott, 433 N. Waller Ave., Chicago.

## FIELD EXPERIENCES

THE Empire Electric Refrigeration Service Co. of New York City has contributed from the experience of their men while in the field the following rather unusual incidents:

### Frozen Refrigerator

In the middle of the night a call was received from a customer whose residence was about one hour's ride from New York City. Upon the arrival of the service man the customer said that everything in the refrigerator was frozen up. The refrigerator had been installed about two days before. There was no temperature control on the machine, so the customer was told to block the switch with a piece of wood if he wanted to freeze ice cream. The service man discovered the blocked switch and asked who had done it. The customer sheepishly admitted that he had and then forgot to remove it. He begged the service man not to mention it to his son-in-law.

*Moral: Do not suggest to the customer to tinker with the machine.*

### Gin in Ice Cube Trays

Another experience, following the receipt of a complaint from a customer that ice cubes would not freeze, was the finding of gin in the ice cube trays, placed there during the course of a party.

*Moral: Always examine the ice cube trays.*

### "Leaking of Electricity"

An experience reported by another service man was the finding of a piece of paper stuck in the outlet box to prevent the "leaking of electricity" from the outlet.

## HOW TO USE THE COMPLAINT CHARTS

INHERENT major refrigeration troubles come into six general classifications and the service engineer should ask himself the following six questions before deciding what to do.

1. Is the orifice too small?
2. Is the orifice too large?
3. Is enough liquid flowing through orifice?
4. Is too much or too little liquid "flowing through"?
5. Is enough vapor returning to compressor?
6. Is too much or too little vapor returning to compressor?

Any factor that interferes with the size of orifice or flow through orifice will cause trouble, and here is where the compound gauge proves its value.

Questions 5 and 6 are answered by testing the efficiency of compressor.

Complaint Chart No. 3, appearing in this issue, is one of a series of eight charts. Charts Nos. 1 and 2 have appeared in the June and July issues, and other charts will be published in succeeding issues.

These Complaint Charts are compiled to assist the service man in diagnosing operating difficulties based on definite complaints as to what part of the system apparently is not functioning.

These Complaint Charts are to be used in conjunction with the Trouble Chart, which also is published in the June issue. The Trouble Chart is a guide for trouble shooting where no specific complaint can be given, as in the event that the machine fails to operate completely and it is necessary to make a thorough test of the entire system.

A limited supply of Trouble Charts are available for subscribers of THE REFRIGERATION SERVICE ENGINEER, who have not received the June issue. A copy may be obtained by addressing the publishers.

It will be noted that these charts have been been arranged so that they may be retained for convenient reference in a flexible pocket binder. Members of the Refrigeration Service Engineers may secure a binder at $1.00 by addressing the National office.

## COMPLAINT CHART NO. 3

C=CAPILLARY TUBE
LF=LOW SIDE FLOAT
HF=HIGH SIDE FLOAT
DA=AUTOMATIC EXPANSION VALVE
DT=THERMOSTATIC EXPANSION VALVE
T=THERMOSTAT CONTROL
P=PRESSURE CONTROL

| CAUSES OF COMPLAINT | SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|
| | LF | | HF | | C | DA | DT |
| | T | P | T | P | T | T | P |
| **COMPLAINT NO. 3—ICE CUBES FREEZE TOO SLOW OR NOT AT ALL** | | | | | | | |
| (a) Small leak in float valve | √ | √ | | | | | |
| (b) Partially stopped up strainer or plugged line | √ | √ | √ | √ | √ | √ | √ |
| (c) Too high cut-in temperature in ice cube chamber | √ | √ | √ | √ | √ | √ | √ |
| (d) Too high cut-out temperature in ice cube chamber | √ | √ | √ | √ | √ | √ | √ |
| (e) Use metal trays for fast freezing | √ | √ | √ | √ | √ | √ | √ |
| (f) Use lower chamber for fast freezing | √ | √ | √ | √ | √ | √ | √ |
| (g) Too long a shut-down period | √ | √ | √ | √ | √ | √ | √ |
| (h) Room temperature too low for operation | √ | √ | √ | √ | √ | √ | √ |
| (i) Impure water. Check Complaint No. 1 | √ | √ | √ | √ | √ | √ | √ |
| **COMPLAINT NO. 4—REFRIGERATOR TOO COLD** | | | | | | | |
| (a) Control set too low | √ | √ | √ | √ | √ | √ | √ |
| (b) Control will not cut-out | √ | √ | √ | √ | √ | √ | √ |
| **COMPLAINT NO. 5—LIQUID LINE FROSTED** | | | | | | | |
| (a) Stuck open liquid pressure valve | | | √ | √ | | | |
| (b) Partially closed receiver valve | √ | √ | √ | √ | √ | √ | √ |
| (c) Clogged or pinched liquid line | √ | √ | √ | √ | √ | √ | √ |

COPYRIGHTED—HERKIMER INSTITUTE OF REFRIGERATION, N. Y.

③

*Cut out along outer line and insert in binder for ready reference.*

FOR LEATHER BINDER WRITE TO H. T. McDERMOTT, SECRETARY REFRIGERATION SERVICE ENGINEERS' SOCIETY, 433 N. WALLER AVE., CHICAGO, ILL.

*The* REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 1 August, 1933 No. 3

RATES OF SUBSCRIPTION
In Advance, Postage Paid
UNITED STATES - - - - - - - - - $2.00 a year
ALL OTHER COUNTRIES - - - - $3.00 a year
Single copies, 25 cents

Advertising rates on application. Make remittances by postoffice or express money orders, international money orders, checks or drafts on Chicago or New York, payable to Nickerson & Collins Co., Publishers.

NICKERSON & COLLINS CO., *Publishers*
General Office.....433 N. Waller Ave., Chicago
Telephone Austin 1303, 1304 and 1305
Eastern Office.....149 Broadway, New York City
Telephone Barclay 7-8275

*Official Organ*
REFRIGERATION SERVICE ENGINEERS' SOCIETY

## ROUNDING OUT PRODUCTION

THE business of servicing household refrigerators and small commercial refrigerating equipment is not alone in that it suffers from its off-season periods. This condition in any industry is undesirable and prevents the permanent employment of the entire operating personnel throughout the year. Servicing of refrigeration is, of course, rapidly expanding as a year around business. Householders are now less likely to shut off their refrigerators as an economic expedient during the winter months, realizing the necessity of proper refrigeration throughout the year. Commercial refrigeration servicing shows a steady demand throughout the year.

It appears evident that refrigeration service engineers and service companies are in a particularly advantageous position to secure the servicing business of other household appliances for these off-season periods.

Refrigeration and heating are closely allied fields. As a consequence of the increasing number of oil burner installations being made, it may be safely assumed that calls for the servicing of this equipment will show a consistent increase yearly.

The efficient servicing of oil burners requires a thorough knowledge of combustion engineering, and THE REFRIGERATION SERVICE ENGINEER suggests that the refrigeration service man familiarize himself with this subject in order to be in a position to command a share of this business.

It appears evident that the combination of refrigeration servicing and oil burner servicing offers the solution for a steady year around business.

* * *

## SERVICE INSPECTIONS

IN an article in the July issue of THE REFRIGERATION SERVICE ENGINEER, it was pointed out that the service engineer could offer to his customer an economic method of maintaining reliable operation of refrigeration equipment, eliminating expensive service calls, or perhaps a complete breakdown of the system at a critical time. Such conditions could be prevented through periodical service inspections, wherein the consumer and service engineer enter into an agreement for this purpose.

In this issue will be found suggested forms of agreement designed to protect both the user and the service man.

The development of the service inspection business presents an opportunity for the service engineer to secure a steady volume of business, particularly from apartment house owners where multiple systems or individual units are used, or from the small user of commercial refrigeration.

There is no question but that the development of such business should ultimately be a profitable source of revenue.

It is an old axiom of the Chinese that their physicians are paid a yearly fee as long as the person employing the doctor is kept well. However, as soon as he becomes ill, the doctor's fee immediately ends, and it is then necessary for him to see that his patient recovers as quickly as possible before his fee continues.

Similarly, it is to the advantage of the service engineeer, under a service inspection agreement, to maintain the refrigeration equipment operating at the highest efficiency.

It is an old story that "an ounce of prevention is worth a pound of cure," and certainly with the exacting demands that refrigeration equipment is put to today, an agreement of this sort should appeal to the user of refrigeration as a most desirable feature.

# THE Question BOX

**Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.**

THE following questions have been presented at recent meetings of Chicago Chapter of the Refrigeration Service Engineers' Society through its "Question Box" and answered by C. E. Hamilton, chairman of the Educational Committee.

Any reader who can supplement the information published is invited to send it to the Editor for publication.

*Question 1.* Does the organization know that there is a Refrigeration Code?

ANSWER. A safety code for mechanical refrigeration was drawn up and approved by the American Standards Association and the American Society of Refrigeration Engineers in October, 1930. This code has been accepted by the industry, approved by the National Board of Fire Underwriters and is the standard used for the preparation of many city codes. It is essential that you be thoroughly familiar with the code, which will be reprinted in a coming issue of our official organ.

*Question 2.* How do you charge the Majestic Model 103 with Sulphur Dioxide gas?

ANSWER. The Majestic Model 103 is a hermetically sealed unit and cannot be charged in the field.

*Question 3.* What is a good method for removing carbon or sulphurous acid deposit from systems?

ANSWER. Wash with carbon tetrachloride. Compressor can be taken apart and washed. The condenser and tubing can be cleaned by using nitrogen or carbon dioxide to blow the carbon tetrachloride through the tubing. The cooling unit may be cleaned by removing and pouring carbon tetrachloride in the unit. Shake the unit from side to side and pour out again.

*Question 4.* How do you charge an Electrice Machine?

ANSWER. The Electrice Machine is a rotary gear type machine using a charge of 9.35 lbs. sulphur dioxide as the refrigerant. A bank of 4 valves are mounted on the condensing unit base and the charging of the machine or the installing of gauges is handled through these valves. One valve is provided with an outlet which is capped. To charge the machine, this cap is removed and a refrigerant drum connected. Now opening the valve will allow the refrigerant to enter the system.

*Question 5.* What is Latent Heat of Fusion?

ANSWER. Latent Heat of Fusion is the quantity of heat in B.t.u. required to change a solid into a liquid, the change taking place at a constant temperature. Another latent heat which we are interested in in refrigeration is the "Latent Heat of Vaporization," which is the quantity of heat in B.t.u. required to change a liquid into a vapor, the change taking place at a constant temperature.

## NO TEMPERATURES

THEY tell this one on a newly married couple: A complaint was received that the refrigerator was not maintaining temperatures.

A hurry-up call brought the service man to diagnose the trouble.

The newly-weds, desiring their new home spic and span in every respect, had conceived the happy idea of very carefully placing decorative oilcloth completely over each shelf in the refrigerator, thereby doing a thorough job of retarding the circulation of the air flow.

# REFRIGERATION SERVICE ENGINEERS' SOCIETY

**Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.**

**THE OBJECTS OF THE SOCIETY**

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

**ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.**

## MEETINGS OF CHAPTERS

### Detroit Chapter No. 1 Organized

**Meeting of July 19**

PURSUANT to a call for a meeting of service men of Detroit and vicinity, to consider the advisability of the organization of a local chapter to affiliate with the Refrigeration Service Engineers' Society, fifty-one service men responded.

The meeting was called to order at 8:30 p. m. at the Cass Technical School, with Mr. J. M. Oberc presiding. He introduced Mr. J. F. Nickerson, of Chicago, who has been instrumental in the formation of the National Society and local chapters, and is publisher of the Society's official organ, THE REFRIGERATION SERVICE ENGINEER. Mr. H. T. McDermott, National Secretary of the Society, was also introduced.

Mr. Oberc called upon Mr. Nickerson, who explained at length the purposes and the educational advantages of a local chapter of the Refrigeration Service Engineers' Society. After a brief discussion by the members present, the following resolution was offered and unanimously carried:

WHEREAS: It is the consensus of opinion of those present that it is desirable to organize a cooperative society for the purpose of further education and elevation of men engaged in the business of installing and servicing domestic and small commercial equipment, and for social intercourse, now therefore be it

RESOLVED, That we immediately proceed to form and organize a local chapter of the Refrigeration Service Engineers' Society by the adoption of a Constitution and By-Laws, in conformity with that of the National body, and that we further proceed to elect temporary officers, and make formal application to the Refrigeration Service Engineers' Society for charter for a local chapter.

Following the adoption of this motion, Mr. J. F. Nickerson suggested that a proposed Constitution and By-Laws should be considered, and asked the National Secretary to read the suggested Constitution and By-Laws which have been prepared for the guidance of local Chapters, and which conform to the National Constitution and By-Laws.

It was decided that the territorial jurisdiction of Detroit Chapter should include the territory of Detroit within a radius of 100 miles. It was moved and seconded that the Constitution and By-Laws, as read, be adopted.

Mr. Nickerson suggested that the next order of business was the election of temporary officers. Accordingly nominations were asked for from the floor, and the following nominees suggested: L. R. Richards, President; Max Rothenberg, Secretary; Walter E. Klein, Treasurer. No further nominations being suggested, the officers were duly elected.

A petition for charter to the National Society was signed by thirty-five members.

It was also suggested that the next meeting to complete organization plans be held in two weeks, and that the President be authorized to set the meeting place and date, and all those in attendance, as well as other service men in the Detroit vicinity, be invited to attend.

Brief talks were given by the temporary officers elected.

## Greater Chicago Chapter No. 1

### Meeting of July 11

AFTER the usual business of the meeting was dispensed with, Dr. J. D. Jordan, Sales Engineer and Service Manager, Grunow Corporation, was introduced, and gave an interesting talk on the construction and operation of the Grunow refrigerator, using the new carrene gas as a refrigerant. Dr. Jordan's talk was illustrated with graphic charts, which he described.

Following the educational program, President Fowler announced that the balance of the evening would be devoted to the subject of determining the basis of costs for the charging of refrigerants in machines. A general discussion was participated in by the members present, and he then suggested that the Committee on Standards conduct a survey and report its findings at the meeting of July 25.

President Fowler also announced the addition of the following members to this committee: Messrs. Harry Goldberg, Charles E. Paine and Jack Hourihan. Mr. John S. Northcote was appointed temporary sergeant-at-arms.

### Meeting of July 25

After dispensing with the usual order of business, President Fowler turned the meeting over to Mr. C. E. Hamilton, chairman of the Educational Committee, who in turn introduced Mr. H. T. Lange, of the Alco Valve Co., who addressed the members of Chicago Chapter on "Automatic Control Valves for Refrigeration Work," as manufactured by their company. Mr. Lange's talk was illustrated by lantern slides.


**FORSLUND *for* REFRIGERATION SUPPLIES**

*Factory Distributors & Jobbers*

Wolverine Dehydrated Copper Tubing
Mueller Fittings & Valves
Dayton Belts & Drives
Penn Controls & Water Valves

Fin Coils—Expansion Valves
Refrigerant Gases & Oils
Filters—Dehydrators
Thermometers—Gauges
Brine & Water Pumps
Flaring, Bending & Cutting Tools

Everything for the Service Department. Complete Stocks in Kansas City. Write or Call for Catalogs and Prices.

**Forslund Pump & Machinery Co.**
3033 Main St.
Phones Valentine 4310-4311
Kansas City, Mo.

SUPPLIES — PARTS — COILS — CHEMICALS — MATERIALS — UNITS

REFRIGERATION SPECIALTIES
*"With Estimating Service for Service Engineers"*

SERVICEMEN SUPPLY CO.
1819 Broadway, NEW YORK CITY

GUARANTEED REPLACEMENT
**PARTS**
FOR ALL STANDARD ELECTRIC REFRIGERATORS
WRITE FOR OUR CATALOGUE
REFRIGERATOR PARTS COMPANY
2517 South Wabash CHICAGO, ILL.

After the educational program, President Fowler called upon Mr. Henry Seidenbecher, chairman of the Committee on Standards, for his report, and Mr. Seidenbecher requested Mr. Harry Goldberg, secretary of the Committee, to read the report.

The report presented was as follows:

**Report of Committee on Standards**

It is common knowledge to all engaged with repairing of electric refrigeration that practices obviously harmful to the trade are permitted to endure, very little effort in the past being spent to circumvent them. This has resulted in an unfair and chaotic condition whereby people engaged in this line of endeavor have all suffered materially to great extent. That standard codes should be adopted in any given trade or profession whereby the members of said trade can get for his services ample funds for subsistence is the basic thought of all men engaged in business or otherwise. Particularly are these sentiments in accord with the government at this time.

In the past, repair men have been the victims of parties whose intentions have been to get something for nothing. As possession is nine points of the law and as repair men cannot carry out labor or parts placed in such jobs, they are truly at the mercy of such persons who after getting their refrigeration want it free or for only part of what the refrigeration man requests. Your committee suggests that at each meeting of this chapter a list of such people who will not pay their just bills or who make unjust claims be filed with the secretary. This will prepare other repair men as to the possibilities of collection when called on such jobs, and should have a clarifying and wholesome influence upon refrigeration business in general.

With reference to the rate for charging of methyl chloride refrigerant. First, let us remember that only a few concerns manufacture gases. Secondly, the manufacturers of refrigerants are in a class aside from other refrigeration manufacturers. It is then apparently quite easy to get them to assent to whom these gases will be sold. While rumors are far from few regarding methyl chloride machines being charged with gas at the rate of 50c per lb. your committee can find no concern to admit such practices. It is well to remember at this time that the National Recovery Act passed by Congress recently, was meant to defeat just such unfair practices and we need only bide our time when some general code will be decided upon as fair.

In charging a machine with methyl chloride, your committee has in mind many of the difficulties to overcome to obtain this refrigerant. First, because of its elusive and volatile nature, many jobbers will not stock it. It is necessary sometimes to travel miles in one direction to get it and then again travel miles to the machine to charge it. It stands to reason then that if only one or two pounds are required, the owner should pay more for it per pound than the man requiring 60 or 90 lbs. in a multiple job. The tentative prices suggested as fair to all are as follows:

**REPLACEMENT PARTS**
**For Frigidaires**
Eccentrics—Connecting Rods—
Shafts—Pistons—Pins—Rings—
Gaskets—Flapper Blades and Discs
also
Gaskets for Kelvinator and Servel.
*ALL GASES—BELTS—TUBING—*
*FITTINGS—TOOLS*
**Iceless Refrigeration**
**Accessories Co.**
2401-15 Chestnut Street, Philadelphia, Pa.

S. F. FISCHER, PRESIDENT & TREAS. PHONE LINCOLN 7819 H. F. GERSTNER, SEC'Y
E. M. FISCHER, VICE PRES. E. A. HOELZL, GEN. MGR

**Monarch Electric Maintenance Co.**

GENERATORS, MOTORS, ARMATURES REWOUND & REPAIRED

Special low prices and service on refrigeration motors to service men.

MOTOR PARTS AND BRUSHES
317-19 STARR STREET
*LOCATION: 300 West — 1600 North*

We do the work for most of the independent firms in Chicago. Why not try us?

### For Methyl Chloride

For 1 to 5 lbs.....$1.25 per lb.
For 6 to 15 lbs..... .95 per lb.
For 16 to 30 lbs..... .87 per lb.

Where money is paid in advance for 60 lbs. and 90 lbs. sealed lots 70c per lb.

### For Sulphur Dioxide

For 1 to 5 lbs.....$0.90 per lb.
For 6 to 10 lbs..... .70 per lb.
For 11 to 35 lbs..... .50 per lb.
For 36 lbs. over..... .35 per lb.

### For Ammonia

For 1 to 25 lbs.....$0.50 per lb.
For 26 lbs. over..... .40 per lb.

Your committee does not approve of divulging trade secrets or net prices to any persons not actively engaged in refrigeration activities. It specifically disapproves the pastime of letting people other than refrigeration repair men, to pick up parts, gas, etc. It disapproves of catalogs giving net prices to the trade as this makes it possible for any one to ascertain prices and in this way materially lessens the earning of men engaged in business. Along this line, it is suggested that members be presented with cards to identify themselves and employees.

This committee does not favor the practices of some refrigeration people of knocking any manufacturer's product. Most of the time, such knocking is due to lack of knowledge of that particular machine and such knocking will only direct the enmity of the manufacturer upon the repair man, who retaliates by refusing to sell parts when needed by the repair man.

This committee also disapproves of knocking of other refrigeration repair work other than their own. After hearing about three or four individual repair men knock each other, the owner of the machine is most likely to have the manufacturer of his particular machine or the distributor repair it, in this way no one being materially benefited.

A copy of these recommendations should be sent to all men engaged in refrigeration repair work located in the territory covered by the Chicago chapter whether belonging to this chapter or otherwise. A copy should also be sent to Headquarters office with a request that copies be sent to the several chapters of the R. S. E. S.

Respectfully submitted,

COMMITTEE ON STANDARDS,
Greater Chicago Chapter No. 1,
Henry Seidenbecher, *Chairman*,
Harry Goldberg, *Secretary*,
George Delaney,
Charles Paine,
Harry Busby,
John Hourihan.

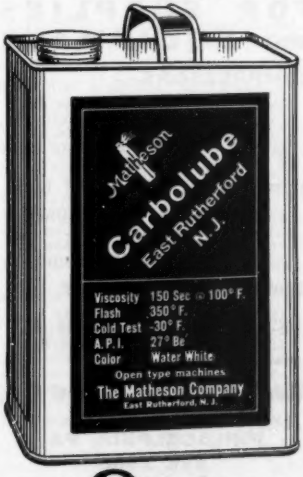

**PISTON RINGS**

All sizes and over sizes from 1 in. to 34 in. diameter. Immediate shipment upon receipt of order. Write for prices.

**SUPERIOR PISTON RING CO.**
3537 W. Harrison St., CHICAGO, ILL.



The Matheson Co.
East Rutherford, N. J.
REFRIGERATOR




— OILS —

The Matheson Co.

East Rutherford, N. J.

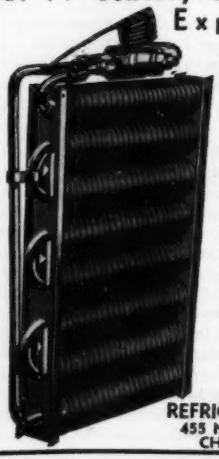
**Will ship any quantity of any refrigerant to any one any where at any time by any route in any ICC cylinder.**



RADIAL The New REFRIGERATION COIL

Cooling Coils for Every Purpose

Over 150 installations at A Century of Progress Exposition, CHICAGO



The approved beer coil! Draught, bottle or barrel compartment coils. Submerged or exposed surface.

*Patents Pending*

COMMERCIAL COIL & REFRIGERATION CO.
455 N. Artesian Ave.
CHICAGO, ILL.



*Eastern*

**HEADQUARTERS FOR SUPPLIES and EQUIPMENT**

**COMPRESSORS—**

Complete line domestic, commercial, air-conditioning, beer cooling, display case, ice cream cabinets. Sizes up to 3 H. P.

**SUPPLIES—**

Dehydrated copper tubing, block tin coils, fittings, controls, valves, service tools, beer cooling supplies, pumps.

**IMMEDIATE DELIVERY**

Catalogs and Price Lists on request. Submit any problem for experienced engineering advice.

**Merchant & Evans Co.**

Manufacturers—Distributors
PHILADELPHIA, PA.
Est. 1866
Bell Phone DEWey 7900
7th Year in Refrigeration



**Education Is Power**

Service men experienced on one make of refrigerating apparatus have not time to master all makes on the long, hard road of experience.

Enjoy five weeks in New York, while learning practical servicing by private instruction, *on all systems,* with tools, not books.

**Sulphur dioxide Ethyl chloride**
**Isobutane F-12**
**Methyl chloride Ammonia**

Direct expansion—high pressure float—low pressure float—capillary tube—thermostatic expansion—domestic and commercial systems.

Write for Bulletin R. S. E. for details of the most concise, advanced course to finish your refrigeration education. Are you interested in oil burner servicing? Write for Bulletin O. B. E.

**HERKIMER INSTITUTE OF MECHANICAL TRADES**
**1819 Broadway, New York City**

## Come to Headquarters for PARTS and SUPPLIES

MANUFACTURERS and DISTRIBUTORS

GEORGE MONJIAN, Pres.

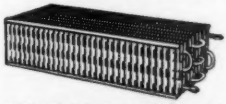
**CHICAGO REFRIGERATION SERVICE CO.**

360-362 East Grand Avenue

Whitehall 7340 — Chicago, Ill.

The largest supply house of refrigeration parts. Replacements parts for all makes of electrical refrigerators. Our Modern Shop — the best equipped in the middle west — can repair all equipment for household and commercial refrigeration systems.

## Complete Stocks of the Finest Parts and Supplies



Distributors for

**FEDDERS MFG. CO.** COMMERCIAL COILS — DOMESTIC EVAPORATORS — Automatic and Thermostatic VALVES — NEEDLES — SEATS — etc.

PENN COLD CONTROLS

TURNER GAS LEAK DETECTORS

HIGH-SIDES AND COMPRESSORS

WAREHOUSE FOR ANSUL $SO_2$

METHYL CHLORIDE

BEER COOLERS and All Beer Supplies, Coils, Taps Faucets, Overflows, Xcem Cleaning Compound, etc.

ENGINEERING SERVICE

**STANDARD REFRIGERATION PARTS CO.**

5101 W. Madison St., CHICAGO

AUSTIN 6343

## ANSUL SULPHUR DIOXIDE

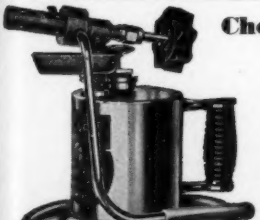
*The CHOICE of Those Who Demand the Best*

A number of large manufacturers have commissioned us to supply the sulphur dioxide requirements of all their distributors. High quality of product in individually analyzed cylinders, nation-wide distribution from over 40 warehouse stocks gave us this business. The same factors have influenced service men everywhere to standardize on Ansul Sulphur dioxide. Write for quotation and location of nearest warehouse stock.

*Absolute Uniformity*

ANSUL CHEMICAL COMPANY

MARINETTE, WIS.



## Check Your Next Service Job with A TURNER HALIDE DETECTOR

It will positively detect leakage of any Chlorinated Hydrocarbon Refrigerant including Artic, Methyl Chloride, Ethyl Chloride, F-12, F-114, Freon, Carrene, Methylene Chloride, Trichlore-ethylene, and Dichlorodifluoromethane.

The TURNER Halide Detector is carried and used by thousands of service men. It is indispensable for making field tests as it is extremely sensitive and will detect minute leaks and yet is very easily handled and operated. Order a test sample now and save time and expense.

*WRITE FOR CATALOG "C" AND PRICES*

**THE TURNER BRASS WORKS, Sycamore, Illinois**

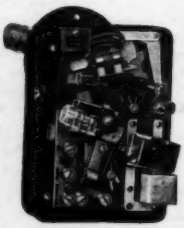
# MERCOID
## AUTOMATIC CONTROL

*for*
## OIL BURNER EQUIPMENT

### MERCOID SENSATHERM
*(Thermostat)*
**For Low or High Voltage Applications**
*Listed by Underwriters' Laboratories, Inc*

Mercoid Sensatherms are used with all types of electrical controlled heating equipment such as oil burners, stokers, gas burners air conditioners, unit heaters, etc. It is one of the most sensitive instruments produced and is extremely accurate and dependable in operation. An object of beauty and mechanical perfection. Write for bulletin No. 100.

### MERCOID "K" LINE CONTROLS
A new and complete line of modern safety and ignition controls for various types of oil burners. These controls are easy to install and offer a profitable replacement business to dealers in equipping old burners with "K" controls, thereby making obsolete installations up-to-date at little expense. Write for catalog H-8.



*Type K M 1*

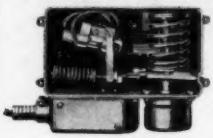
### MERCOID BOILER CONTROLS

*Fig. 31*

A complete line for various boiler applications. These controls have proven by their unfailing performance over years of long service to be the correct type of limiting devices for automatic oil burners or stokers. The Mercoid Pressure Control fig. 31 is a positive safety limiting device for steam boilers. The range is from 1 to 10 lbs., differential 3 lbs. Write for bulletins 200 and 220.

*for*
## REFRIGERATION EQUIPMENT

### NO. 848, Model S THERMOSTAT



*Model S*

This instrument is extensively used on various makes of refrigeration equipment. It is intended for control of air temperature where a differential adjustment is required.
Other models available. Write for complete refrigeration catalog R-4.

### HIGH PRESSURE SAFETY CUT-OUT—*For use on Ammonia and CO₂*

*Fig. 61*

Mercoid High Pressure Safety Cut-Out Controls are giving years of dependable service under the most exacting requirements.
They are actuated by a heavy steel Bourdon tube of the correct size and specially treated for accurate and enduring performance. Furnished with bottom connection or for panel mounting. Complete information upon request.

### FEDERAL WARRANTED AMMONIA GAUGES

These gauges insure accurate performance and long life. They are made with non-corrosive movements, thus preventing deterioration.
Two color dials available for all Ammonia Gauges ranging from sizes 2½" to 8½" which show the pressure graduation in black and the corresponding temperature degrees in red. Write for Gauge Catalog G-6.

There are many desirable features incorporated in Mercoid controls. They are equipped throughout with mercury sealed contact switches which eliminate troubles caused by corrosion, open arcing, pitting or oxidation. The simple two wire hook-up with plainly marked terminals facilitate easy installation.
Use Mercoid automatic standard controls on your service work and be assured of unfailing performance.

NRA MEMBER U.S. WE DO OUR PART

## THE MERCOID CORPORATION
*Sole Manufacturers of The Mercoid Switch*